PATENT ABSTRACTS OF JAPAN

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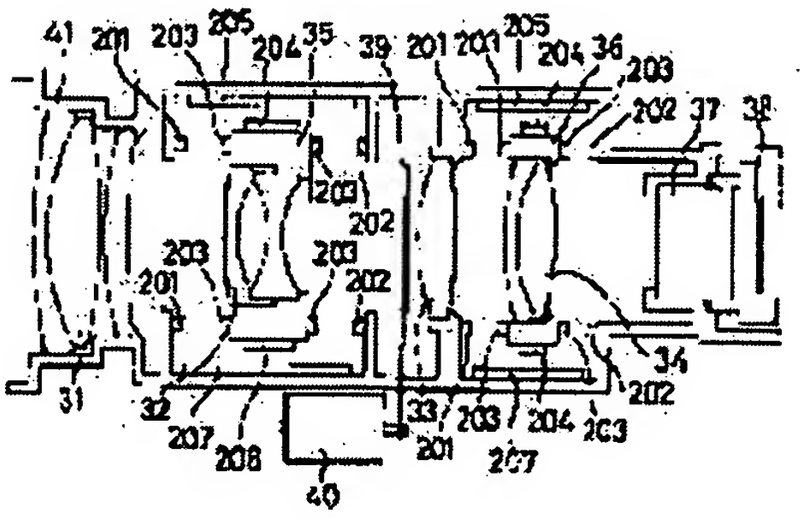
(54) OPTICAL DEVICE

(57)Abstract:

PURPOSE: To make an optical device inexpensive, light in weight and small in size and to perform quiet operation by suspending and supporting the holding frame of an optical element for correcting image blurring to the optical device by magnetic force and moving the holding frame in a direction orthogonally crossing an optical axis by controlling the magnetic force.

CONSTITUTION: Magnetic force generating members 204 to 207 such as a permanent magnet or an electromagnet hold the holding member 35 of a 2nd lens group 32 and the holding member 36 of a 4th lens group 34 functioning as the optical element for correcting image blurring on an image formation surface in non-contact with a housing 41 in a direction perpendicular to the optical axis. Magnetic force generating members 201 to 203 move the holding members 35 and 36 in non-contact with the housing 41 in the optical axis direction and the suspension is supported. A control means converts vibration such as camera shake detected by a shake sensor into a displacement value to be corrected and controls the magnitude of a current flowing in the electromagnets 203, 205 and 207 out of the generating members 201 to 207, so that the holding members 35 and 36 are moved in the direction perpendicular to the optical axis direction and image blurring is restrained.



LEGAL STATUS

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] Especially this invention relates to the optical equipment which has the optical element for image Bure amendment for amending this BURE in an image formation side about optical equipments, such as a camera and an observation device.
[0002]
[Description of the Prior Art] The Bure amendment lens-barrel which controls image Bure is known by moving some lenses which constitute a taking lens in the direction vertical to an optical axis as a means to control Bure of the photography image by the oscillation of blurring etc. Drawing 6 is the block diagram of the zoom lens possessing the conventional Bure amendment device. For 1a, in drawing 6 R> 6, the 1st lens group and 1b are [the 3rd lens group and 1d of the 2nd lens group and 1c] the 4th lens groups. Because of zooming, the 1d of the 4th lens groups has respectively 2nd lens group 1b movable in the direction of a predetermined range optical axis in it because of focusing. The Bure amendment device which furthermore mentions the 1d of the 4th lens groups later amends Bure by making it move in the direction vertical to the direction of an optical axis. 2 is an optical low pass filter and 3 is image sensors, such as CCD. 4 is a case holding 1st lens group 1a, 3rd lens group 1c, and image sensor 3 grade. It is the guide bar to which 5 shows the lens attachment component of the 2nd lens group, and 6 shows the optical-axis directional movement of the 2nd lens group attachment component 5. 7 is screwed in the screw-thread hole which is a feed screw parallel to an optical axis, and was prepared in the 2nd lens group attachment component 5, and moves this attachment component 5 in the direction of an optical axis. The feed screw 7 was put aside, was energized with the spring 8, was put aside, has geared also to the member 9, and is performing backlash picking of a screwing part by this member 9. It moves in the direction of an optical axis, the 2nd lens group attachment component 5 being supported by the guide bar 6 and the feed screw 7. 10 is a step motor, and this motor 10 carries out revolution actuation of the feed screw 7 through the gear group 11, and drives the 2nd lens group attachment component 5. 12 is the lens frame of the 1d of the 4th lens groups (namely, image Bure correcting lens), and 13 is the maintenance frame of the lens frame 12. The lens frame 12 being supported on the maintenance frame 13, and ****ing to anterior part flange 13a of the maintenance frame 13, and back flange 13b, in the direction vertical to an optical axis, although it is movable (radial), migration is regulated in the direction of an optical axis. 14 is an energization spring. 15 -- pressing -- a pin and 16 -- the drive motor of the Bure amendment device, and 17 -- an actuation lever -- it comes out. The energization spring 14 energizes and presses the lens frame 12 against above [of drawing], the point of a pin 15 is pushed in the direction which counters in the energization direction of the energization spring 14 by the actuation lever 17, and positioning of a direction vertical to the direction of an optical axis of the lens frame 12 is performed by them.
[0003] Focus actuation is performed when the maintenance frame 13 is moved in the direction of an optical axis by screwing with the feed screw 19 and the screw-thread hole of the maintenance frame 13 linking directly to the step motor 18 for focuses. 20 is converging section material and the diameter of

opening of drawing changes with the sources 21 of power, such as a motor.
[0004] Drawing 7 is the block diagram which looked at the above-mentioned Bure amendment device part from the object side. In drawing 7 , the same number is given to the same component as drawing 6 , and x is added to the component of the amendment device of x directions at a reference number, y is added to the component of the amendment device of the direction of y at a reference number, and it expresses. 401 is BURESENSA, such as an angular-velocity meter, and 402 is a position sensor which detects the location of the x directions of the 1d of the 4th lens groups, and the direction of y. 403 is the control circuit of the Bure amendment device. It is fixed to the lens barrel 4, i.e., the above-mentioned case, and BURESENSA 401 is changed into the displacement value to which the oscillation of blurring etc. should be detected as an angular velocity and the detected signal should amend it by the control circuit 403. With the output signal of this displacement value, a drive motor 16 drives, and it reaches actuation lever 17, and presses, the 1d of the 4th lens groups is moved through a pin 15, image Bure is controlled, and an image is stabilized in respect of an image pick-up.
[0005]
[Problem(s) to be Solved by the Invention] Since all the image Bure amendment devices are carried in the migration lens frame which must be moved in the direction of an optical axis in the case of zooming or focusing in the conventional example mentioned above, the AUW of this migration lens frame is very big. Therefore, it is difficult to perform zooming and focusing promptly, since the inertial mass of this migration lens frame is dramatically large. In order to perform zooming and focusing promptly, the high power motor was needed, consequently there was a fault it not only causes enlargement of optical equipment and buildup of cost, but that power consumption, friction loss, and the generating noise became large.
[0006] So, the object of this invention is offering the improved optical equipment without such a fault.
[0007]
[Means for Solving the Problem] the conventional optical equipment mentioned above -- setting -- a lens frame -- this optical equipment -- mechanical contact -- with, since the migration device of this lens frame also has structure with mechanical frictions, such as feed screw YAHERIKOIDO like the above-mentioned, while being supported, when starting this lens frame, the big impetus for overcoming the static-friction force is needed, and only the driving force which overcomes dynamical friction resistance is needed also during actuation. And since the high structure of mechanical rigidity is needed in order to support the weight of this lens frame, in order to make rigidity of this optical equipment high, the weight of this optical equipment also cannot but become heavy.
[0008] In this invention, it decided to adopt the configuration to which support the maintenance frame of the optical element for image Bure amendment by non-contact to optical equipment at least, and it is made to move by non-contact as a means to solve such a trouble that is inherent in the conventional technique mentioned above. The support means which carries out floating support of the migration lens maintenance frame by magnetism including the maintenance frame of the optical element for image Bure amendment is specifically established, and it was made to move this lens maintenance frame by non-contact to this optical equipment by changing the magnetism of this support means. In addition, the technical thought which carries out floating support of the migration lens frame by magnetism, and makes it move in the direction of an optical axis by magnetism is well-known, for example, is indicated by JP,59-198409,A.
[0009] This invention solves the trouble of said conventional optical equipment with an image Bure amendment function by applying this well-known technique.
[0010]
[Example] The sectional view of the first example is shown in the optical equipment by this invention at drawing 1 .
[0011] For 31, as for the 2nd lens group and 33, in drawing 1 , the 1st lens group and 32 are [the 3rd lens group and 34] the 4th lens groups. Because of zooming, the 4th lens group 34 has respectively the 2nd lens group 32 movable in the direction of a predetermined range optical axis in it because of a focus. Moreover, the 2nd lens group 32 and the 4th lens group 34 serve as the optical element for image Bure

amendment, and amend image Bure in an image formation side by moving this lens group in the direction vertical to the direction of an optical axis. 37 is an optical low pass filter and 38 is image sensors, such as CCD. 41 is a case holding the 1st lens group 31, the 3rd lens group 33, and image sensor 38 grade. the driving source to which the 2nd lens group attachment component and 39 drive converging section material, and, as for 40, 35 drives the converging section material 39 -- it comes out.
[0012] 204-207 are magnetism generating members, such as a permanent magnet for holding the 2nd lens group attachment component 35 and the 4th lens group attachment component 36 by non-contact to a case 41 in the direction respectively vertical to an optical axis, or an electromagnet, and 201-203 move the 2nd lens group attachment component 35 and the 4th lens group attachment component 36 in the direction of an optical axis by non-contact to a case 41, respectively, and are magnetism generating members, such as a permanent magnet for carrying out floating support, or an electromagnet. Since the support means and driving means for the 2nd lens group 32 movable in the direction of an optical axis for zooming and the 4th lens group 34 movable in the direction of an optical axis for a focus are the same configuration in this example, in the following explanation, it explains to the 2nd lens group attachment component 35.
[0013] Drawing 2 is the block diagram of the magnet which constitutes the support means and driving means for said 2nd lens group attachment component 35. In drawing 2 , 201 and 202 are permanent magnets and are being fixed to the case 41. 203 is an electromagnet which consists of a coil and an iron core, and is being fixed to the 2nd lens group attachment component 35. The 2nd lens group attachment component 35 is moved in the direction of an optical axis by non-contact by the approach of mentioning later using these magnets. 204 and 206 are permanent magnets and are being fixed to the 2nd lens group attachment component 35. 205 and 207 are electromagnets and are being fixed to the case 41. The 2nd lens group attachment component 35 is held by non-contact in the direction vertical to an optical axis by the approach of mentioning later using these magnets.
[0014] 42 is a control means for changing the magnetism of an electromagnet 203,205,207, the output of the location detection means (drawing 7) of the 2nd lens group attachment component 35 and the output of non-illustrated BURESENSA (it is the same as what was shown in drawing 7) are incorporated by this control means 42, and this control means 42 controls the resistance welding time and the energization direction over said electromagnet by the predetermined operation.
[0015] The method of moving the 2nd lens group attachment component 35 in the direction of an optical axis is the same as the approach indicated by JP,59-198409,A.
[0016] The opposed face of a permanent magnet 201 and a permanent magnet 202 is like-pole nature (it sets to drawing 2 and is N pole). If a current is energized on an electromagnet 203 and it becomes a polarity like drawing 2 , the 2nd lens group attachment component 35 will move in the direction of the 3rd lens group (it sets to drawing 2 and is right-hand side), and if the current of hard flow is energized on an electromagnet 203, the 2nd lens group attachment component 35 will move in the direction of the 1st lens group (it sets to drawing 2 and is left-hand side). Therefore, the location of the direction of an optical axis of the 2nd lens group attachment component 35 is controllable by controlling the current which flows on an electromagnet 203 by the control means 42.
[0017] The support means which supports the 2nd lens group attachment component 35 to non-contact in the direction vertical to the direction of an optical axis consists of permanent magnets 204 and 206 and electromagnets 205 and 207. On an electromagnet 205, it energizes so that the polarity of the opposed face of a permanent magnet 204 and an electromagnet 205 may turn into like-pole nature. Similarly, on an electromagnet 207, it energizes so that the polarity of the opposed face of a permanent magnet 206 and an electromagnet 207 may turn into like-pole nature. A permanent magnet 204, an electromagnet 205 and a permanent magnet 206, and an electromagnet 207 are repelled by magnetism, respectively, and suit, and since it is dependent on the magnitude of the current which flows on electromagnets 205 and 207, the repulsive force can carry out non-contact maintenance of the 2nd lens group attachment component 35 by controlling the magnitude of the current which flows on electromagnets 205 and 207 in the location where the direction of an optical axis and the perpendicular direction were decided. Therefore, by controlling the magnitude of the current which changes into the

displacement value which should amend the oscillation of blurring detected by non-illustrated BURESENSA by the control means 42, and flows on electromagnets 205 and 207, the 2nd lens group attachment component 35 is moved in the direction vertical to the direction of an optical axis, image Bure is controlled, and an image is stabilized in respect of an image pick-up. Since the 4th lens group attachment component 36 is also the same configuration in this example as mentioned above, also in the 4th lens group 34, the Bure amendment is possible.

[0018] Moreover, energize a current on an electromagnet 203 and the 2nd lens group 32 is moved in the direction of the 1st lens group (it sets to drawing 2 and is left-hand side), or the direction of the 3rd lens group (it sets to drawing 2 and is right-hand side). After an electromagnet 203, a permanent magnet 201, or a permanent magnet 202 adsorbs Since the iron core, the permanent magnet 201, or permanent magnet 202 of an electromagnet 203 is adsorbing even if it stops the energization to an electromagnet 203,205,207, fixed support of the 2nd lens group attachment component 35 is carried out to a case 41.

[0019] Since non-contact support of the lens attachment component of a moving lens group is carried out with the lens barrel in the configuration of this example as explained above, high-speed auto-focusing or the Bure amendment lens-barrel in which zooming actuation is possible is realizable.

[0020] Although repulsion by magnetism is used for non-contact support of the direction of an optical axis of the 2nd lens group attachment component 35, and a perpendicular direction in said example, non-contact support of the 2nd lens group attachment component 35 may be carried out to the direction of an optical axis, and a perpendicular direction using attraction by energization magnetism so that the polarity of the opposed face of a permanent magnet 204,206 and an electromagnet 205,207 may turn into heteropolarity in the direction of the current which flows on electromagnets 205 and 207. Moreover, an electromagnet 501,502 may be made the configuration fixed to the peripheral face of the 2nd lens group attachment component 35 instead of a permanent magnet 204,206 like drawing 3 R> 3. Furthermore, as shown in drawing 4 , the configuration arranged so that the magnetization direction of magnetism generating members, such as a permanent magnet for controlling the location of the direction of an optical axis of the 2nd lens group attachment component 35 or an electromagnet, may become in the direction of an optical axis may be used. In drawing 4 R> 4, 601 and 603 are permanent magnets and 602 and 604 are electromagnets. On an electromagnet 602, it energizes so that the sense of a permanent magnet 601 and a magnetic pole may become the same. At this time, a permanent magnet 601 and an electromagnet 602 are repelled by magnetism, and suit. Similarly, it energizes also on an electromagnet 604, and a permanent magnet 603 and an electromagnet 604 are repelled by magnetism, and suit. Therefore, non-contact support of the 2nd lens group attachment component 35 (or the 4th lens group attachment component 36) can be carried out by controlling the current which flows on an electromagnet 602,604 in the location where the direction of an optical axis and the perpendicular direction were decided.

[0021] Moreover, you may fabricate by the moving lens attachment component or the case, and one by using a plastic magnet etc. for a permanent magnet, as shown, for example in drawing 5 . In drawing 5 , 701 and 702 are the plastic magnet parts a case 41 and really magnetized with shaping, and 703 is the plastic magnet part a moving lens attachment component (35 36) and really magnetized with shaping. According to such a configuration, a manufacturing cost can be made cheap.

[0022]

[Effect of the Invention] As explained above, with the optical equipment of this invention Since this magnetism was controlled by the control means which incorporates the output signal of the Bure detection means while carrying out floating support of the maintenance frame of the optical element for image Bure amendment magnetically to optical equipment The trouble about actuation of the image Bure amendment optical means in conventional optical equipment with an image Bure amendment function is solved, consequently it is conventionally lightweight and smaller than equipment, and the improved optical equipment with high profitability can be realized possible [quiet actuation].

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] Especially this invention relates to the optical equipment which has the optical element for image Bure amendment for amending this BURE in an image formation side about optical equipments, such as a camera and an observation device.

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TECHNICAL FIELD

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PRIOR ART

[Description of the Prior Art] The Bure amendment lens-barrel which controls image Bure is known by moving some lenses which constitute a taking lens in the direction vertical to an optical axis as a means to control Bure of the photography image by the oscillation of blurring etc. Drawing 6 is the block diagram of the zoom lens possessing the conventional Bure amendment device. For 1a, in drawing 6 R> 6, the 1st lens group and 1b are [the 3rd lens group and 1d of the 2nd lens group and 1c] the 4th lens groups. Because of zooming, the 1d of the 4th lens groups has respectively 2nd lens group 1b movable in the direction of a predetermined range optical axis in it because of focusing. The Bure amendment device which furthermore mentions the 1d of the 4th lens groups later amends Bure by making it move in the direction vertical to the direction of an optical axis. 2 is an optical low pass filter and 3 is image sensors, such as CCD. 4 is a case holding 1st lens group 1a, 3rd lens group 1c, and image sensor 3 grade. It is the guide bar to which 5 shows the lens attachment component of the 2nd lens group, and 6 shows the optical-axis directional movement of the 2nd lens group attachment component 5. 7 is screwed in the screw-thread hole which is a feed screw parallel to an optical axis, and was prepared in the 2nd lens group attachment component 5, and moves this attachment component 5 in the direction of an optical axis. The feed screw 7 was put aside, was energized with the spring 8, was put aside, has geared also to the member 9, and is performing backlash picking of a screwing part by this member 9. It moves in the direction of an optical axis, the 2nd lens group attachment component 5 being supported by the guide bar 6 and the feed screw 7. 10 is a step motor, and this motor 10 carries out revolution actuation of the feed screw 7 through the gear group 11, and drives the 2nd lens group attachment component 5. 12 is the lens frame of the 1d of the 4th lens groups (namely, image Bure correcting lens), and 13 is the maintenance frame of the lens frame 12. The lens frame 12 being supported on the maintenance frame 13, and ****ing to anterior part flange 13a of the maintenance frame 13, and back flange 13b, in the direction vertical to an optical axis, although it is movable (radial), migration is regulated in the direction of an optical axis. 14 is an energization spring. 15 -- pressing -- a pin and 16 -- the drive motor of the Bure amendment device, and 17 -- an actuation lever -- it comes out. The energization spring 14 energizes and presses the lens frame 12 against above [of drawing], the point of a pin 15 is pushed in the direction which counters in the energization direction of the energization spring 14 by the actuation lever 17, and positioning of a direction vertical to the direction of an optical axis of the lens frame 12 is performed by them.
[0003] Focus actuation is performed when the maintenance frame 13 is moved in the direction of an optical axis by screwing with the feed screw 19 and the screw-thread hole of the maintenance frame 13 linking directly to the step motor 18 for focuses. 20 is converging section material and the diameter of opening of drawing changes with the sources 21 of power, such as a motor.
[0004] Drawing 7 is the block diagram which looked at the above-mentioned Bure amendment device part from the object side. In drawing 7 , the same number is given to the same component as drawing 6 , and x is added to the component of the amendment device of x directions at a reference number, y is added to the component of the amendment device of the direction of y at a reference number, and it expresses. 401 is BURESENSA, such as an angular-velocity meter, and 402 is a position sensor which

detects the location of the x directions of the 1d of the 4th lens groups, and the direction of y. 403 is the control circuit of the Bure amendment device. It is fixed to the lens barrel 4, i.e., the above-mentioned case, and BURESENSA 401 is changed into the displacement value to which the oscillation of blurring etc. should be detected as an angular velocity and the detected signal should amend it by the control circuit 403. With the output signal of this displacement value, a drive motor 16 drives, and it reaches actuation lever 17, and presses, the 1d of the 4th lens groups is moved through a pin 15, image Bure is controlled, and an image is stabilized in respect of an image pick-up.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, with the optical equipment of this invention Since this magnetism was controlled by the control means which incorporates the output signal of the Bure detection means while carrying out floating support of the maintenance frame of the optical element for image Bure amendment magnetically to optical equipment The trouble about actuation of the image Bure amendment optical means in conventional optical equipment with an image Bure amendment function is solved, consequently it is conventionally lightweight and smaller than equipment, and the improved optical equipment with high profitability can be realized possible [quiet actuation].

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Since all the image Bure amendment devices are carried in the migration lens frame which must be moved in the direction of an optical axis in the case of zooming or focusing in the conventional example mentioned above, the AUW of this migration lens frame is very big. Therefore, it is difficult to perform zooming and focusing promptly, since the inertial mass of this migration lens frame is dramatically large. In order to perform zooming and focusing promptly, the high power motor was needed, consequently there was a fault it not only causes enlargement of optical equipment and buildup of cost, but that power consumption, friction loss, and the generating noise became large.
[0006] So, the object of this invention is offering the improved optical equipment without such a fault.

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EXAMPLE

[Example] The sectional view of the first example is shown in the optical equipment by this invention at drawing 1 .
[0011] For 31, as for the 2nd lens group and 33, in drawing 1 , the 1st lens group and 32 are [the 3rd lens group and 34] the 4th lens groups. Because of zooming, the 4th lens group 34 has respectively the 2nd lens group 32 movable in the direction of a predetermined range optical axis in it because of a focus. Moreover, the 2nd lens group 32 and the 4th lens group 34 serve as the optical element for image Bure amendment, and amend image Bure in an image formation side by moving this lens group in the direction vertical to the direction of an optical axis. 37 is an optical low pass filter and 38 is image sensors, such as CCD. 41 is a case holding the 1st lens group 31, the 3rd lens group 33, and image sensor 38 grade. the driving source to which the 2nd lens group attachment component and 39 drive converging section material, and, as for 40, 35 drives the converging section material 39 -- it comes out.
[0012] 204-207 are magnetism generating members, such as a permanent magnet for holding the 2nd lens group attachment component 35 and the 4th lens group attachment component 36 by non-contact to a case 41 in the direction respectively vertical to an optical axis, or an electromagnet, and 201-203 move the 2nd lens group attachment component 35 and the 4th lens group attachment component 36 in the direction of an optical axis by non-contact to a case 41, respectively, and are magnetism generating members, such as a permanent magnet for carrying out floating support, or an electromagnet. Since the support means and driving means for the 2nd lens group 32 movable in the direction of an optical axis for zooming and the 4th lens group 34 movable in the direction of an optical axis for a focus are the same configuration in this example, in the following explanation, it explains to the 2nd lens group attachment component 35.
[0013] Drawing 2 is the block diagram of the magnet which constitutes the support means and driving means for said 2nd lens group attachment component 35. In drawing 2 , 201 and 202 are permanent magnets and are being fixed to the case 41. 203 is an electromagnet which consists of a coil and an iron core, and is being fixed to the 2nd lens group attachment component 35. The 2nd lens group attachment component 35 is moved in the direction of an optical axis by non-contact by the approach of mentioning later using these magnets. 204 and 206 are permanent magnets and are being fixed to the 2nd lens group attachment component 35. 205 and 207 are electromagnets and are being fixed to the case 41. The 2nd lens group attachment component 35 is held by non-contact in the direction vertical to an optical axis by the approach of mentioning later using these magnets.
[0014] 42 is a control means for changing the magnetism of an electromagnet 203,205,207, the output of the location detection means (drawing 7) of the 2nd lens group attachment component 35 and the output of non-illustrated BURESENSA (it is the same as what was shown in drawing 7) are incorporated by this control means 42, and this control means 42 controls the resistance welding time and the energization direction over said electromagnet by the predetermined operation.
[0015] The method of moving the 2nd lens group attachment component 35 in the direction of an optical axis is the same as the approach indicated by JP,59-198409,A.
[0016] The opposed face of a permanent magnet 201 and a permanent magnet 202 is like-pole nature (it

sets to drawing 2 and is N pole). If a current is energized on an electromagnet 203 and it becomes a polarity like drawing 2 , the 2nd lens group attachment component 35 will move in the direction of the 3rd lens group (it sets to drawing 2 and is right-hand side), and if the current of hard flow is energized on an electromagnet 203, the 2nd lens group attachment component 35 will move in the direction of the 1st lens group (it sets to drawing 2 and is left-hand side). Therefore, the location of the direction of an optical axis of the 2nd lens group attachment component 35 is controllable by controlling the current which flows on an electromagnet 203 by the control means 42.

[0017] The support means which supports the 2nd lens group attachment component 35 to non-contact in the direction vertical to the direction of an optical axis consists of permanent magnets 204 and 206 and electromagnets 205 and 207. On an electromagnet 205, it energizes so that the polarity of the opposed face of a permanent magnet 204 and an electromagnet 205 may turn into like-pole nature. Similarly, on an electromagnet 207, it energizes so that the polarity of the opposed face of a permanent magnet 206 and an electromagnet 207 may turn into like-pole nature. A permanent magnet 204, an electromagnet 205 and a permanent magnet 206, and an electromagnet 207 are repelled by magnetism, respectively, and suit, and since it is dependent on the magnitude of the current which flows on electromagnets 205 and 207, the repulsive force can carry out non-contact maintenance of the 2nd lens group attachment component 35 by controlling the magnitude of the current which flows on electromagnets 205 and 207 in the location where the direction of an optical axis and the perpendicular direction were decided. Therefore, by controlling the magnitude of the current which changes into the displacement value which should amend the oscillation of blurring detected by non-illustrated BURESENSA by the control means 42, and flows on electromagnets 205 and 207, the 2nd lens group attachment component 35 is moved in the direction vertical to the direction of an optical axis, image Bure is controlled, and an image is stabilized in respect of an image pick-up. Since the 4th lens group attachment component 36 is also the same configuration in this example as mentioned above, also in the 4th lens group 34, the Bure amendment is possible.

[0018] Moreover, energize a current on an electromagnet 203 and the 2nd lens group 32 is moved in the direction of the 1st lens group (it sets to drawing 2 and is left-hand side), or the direction of the 3rd lens group (it sets to drawing 2 and is right-hand side). After an electromagnet 203, a permanent magnet 201, or a permanent magnet 202 adsorbs Since the iron core, the permanent magnet 201, or permanent magnet 202 of an electromagnet 203 is adsorbing even if it stops the energization to an electromagnet 203,205,207, fixed support of the 2nd lens group attachment component 35 is carried out to a case 41.

[0019] Since non-contact support of the lens attachment component of a moving lens group is carried out with the lens barrel in the configuration of this example as explained above, high-speed auto-focusing or the Bure amendment lens-barrel in which zooming actuation is possible is realizable.

[0020] Although repulsion by magnetism is used for non-contact support of the direction of an optical axis of the 2nd lens group attachment component 35, and a perpendicular direction in said example, non-contact support of the 2nd lens group attachment component 35 may be carried out to the direction of an optical axis, and a perpendicular direction using attraction by energization magnetism so that the polarity of the opposed face of a permanent magnet 204,206 and an electromagnet 205,207 may turn into heteropolarity in the direction of the current which flows on electromagnets 205 and 207. Moreover, an electromagnet 501,502 may be made the configuration fixed to the peripheral face of the 2nd lens group attachment component 35 instead of a permanent magnet 204,206 like drawing 3 R> 3. Furthermore, as shown in drawing 4 , the configuration arranged so that the magnetization direction of magnetism generating members, such as a permanent magnet for controlling the location of the direction of an optical axis of the 2nd lens group attachment component 35 or an electromagnet, may become in the direction of an optical axis may be used. In drawing 4 R> 4, 601 and 603 are permanent magnets and 602 and 604 are electromagnets. On an electromagnet 602, it energizes so that the sense of a permanent magnet 601 and a magnetic pole may become the same. At this time, a permanent magnet 601 and an electromagnet 602 are repelled by magnetism, and suit. Similarly, it energizes also on an electromagnet 604, and a permanent magnet 603 and an electromagnet 604 are repelled by magnetism, and suit. Therefore, non-contact support of the 2nd lens group attachment component 35 (or the 4th lens group

attachment component 36) can be carried out by controlling the current which flows on an electromagnet 602,604 in the location where the direction of an optical axis and the perpendicular direction were decided.

[0021] Moreover, you may fabricate by the moving lens attachment component or the case, and one by using a plastic magnet etc. for a permanent magnet, as shown, for example in drawing 5 . In drawing 5 , 701 and 702 are the plastic magnet parts a case 41 and really magnetized with shaping, and 703 is the plastic magnet part a moving lens attachment component (35 36) and really magnetized with shaping. According to such a configuration, a manufacturing cost can be made cheap.

[Translation done.]

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MEANS

[Means for Solving the Problem] the conventional optical equipment mentioned above -- setting -- a lens frame -- this optical equipment -- mechanical contact -- with, since the migration device of this lens frame also has structure with mechanical frictions, such as feed screw YAHERIKOIDO like the above-mentioned, while being supported, when starting this lens frame, the big impetus for overcoming the static-friction force is needed, and only the driving force which overcomes dynamical friction resistance is needed also during actuation. And since the high structure of mechanical rigidity is needed in order to support the weight of this lens frame, in order to make rigidity of this optical equipment high, the weight of this optical equipment also cannot but become heavy.
[0008] In this invention, it decided to adopt the configuration to which support the maintenance frame of the optical element for image Bure amendment by non-contact to optical equipment at least, and it is made to move by non-contact as a means to solve such a trouble that is inherent in the conventional technique mentioned above. The support means which carries out floating support of the migration lens maintenance frame by magnetism including the maintenance frame of the optical element for image Bure amendment is specifically established, and it was made to move this lens maintenance frame by non-contact to this optical equipment by changing the magnetism of this support means. In addition, the technical thought which carries out floating support of the migration lens frame by magnetism, and makes it move in the direction of an optical axis by magnetism is well-known, for example, is indicated by JP,59-198409,A.
[0009] This invention solves the trouble of said conventional optical equipment with an image Bure amendment function by applying this well-known technique.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view of one example of the optical equipment by this invention.
[Drawing 2] Detail drawing about the part shown in drawing 1 .
[Drawing 3] Drawing having shown the deformation example of the part shown in drawing 2 .
[Drawing 4] Drawing having shown the deformation example of the part shown in drawing 2 .
[Drawing 5] Drawing having shown the deformation example of the part shown in drawing 2 .
[Drawing 6] The outline sectional view of the well-known lens barrel which builds in an image Bure amendment device.
[Drawing 7] The conceptual diagram which extracted only the part of an image Bure amendment device among the structures shown in drawing 6 , and was seen from the head side of a lens barrel.
[Description of Notations]
1a -- The 1st lens group 1b -- The 2nd lens group
1c -- The 3rd lens group 1d -- The 4th lens group
2 -- Optical low pass filter 3 -- Image sensor
4 -- Case 5 -- The 2nd lens group attachment component
6 -- Guide bar 7 -- Feed screw
8 -- It puts aside and is a spring. 9 -- It puts aside and is a member.
10 -- Step motor 11 -- Gear group
12 -- Lens frame 13 -- Maintenance frame
14 -- Energization spring 15 -- It presses and is a pin.
16 -- Motor for the Bure amendment 17 -- Actuation lever
18 -- Step motor for focuses 19 -- Feed screw
20 -- Converging section material 21 -- Source of power
31 -- The 1st lens group 32 -- The 2nd lens group
33 -- The 3rd lens group 34 -- The 4th lens group
35 -- The 2nd lens group attachment component 36 -- The 4th lens group attachment component
37 -- Optical low pass filter 38 -- Image sensor
39 -- Converging section material 40 -- Source of power
41 -- Case 42 -- Control means
201,202,204,206 -- Permanent magnet
203, 205, 207, 501,502,602,604 -- Electromagnet
701-703 -- Plastic magnet part

[Translation done.]

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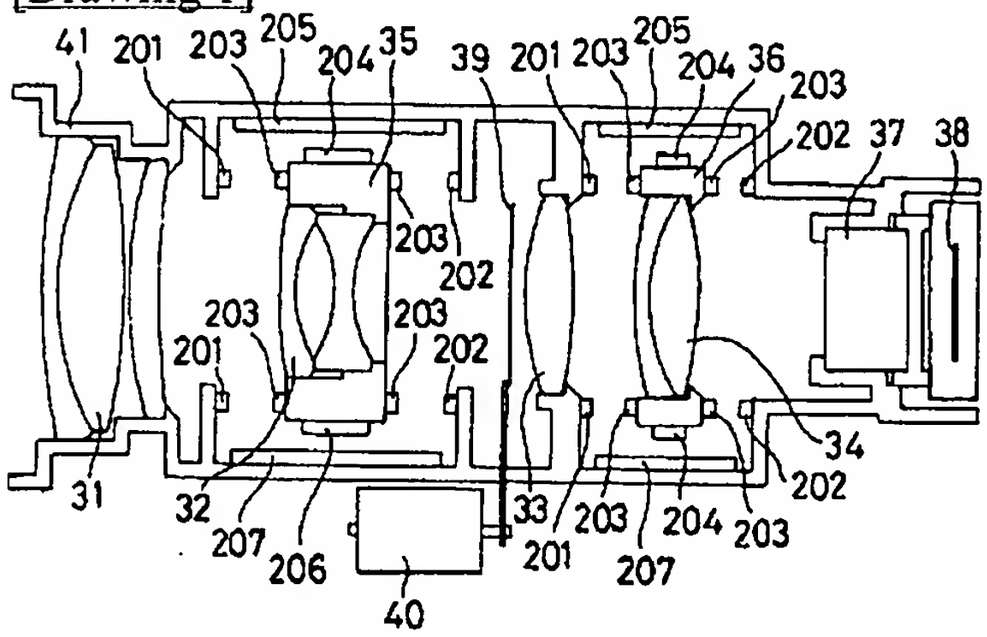
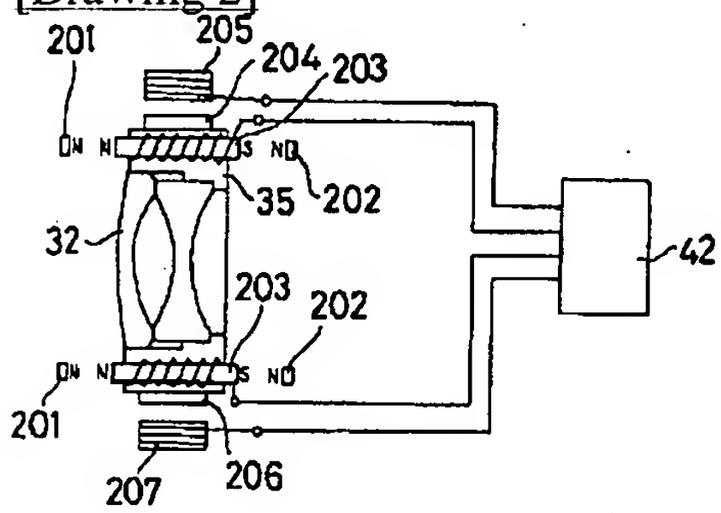
DRAWINGS

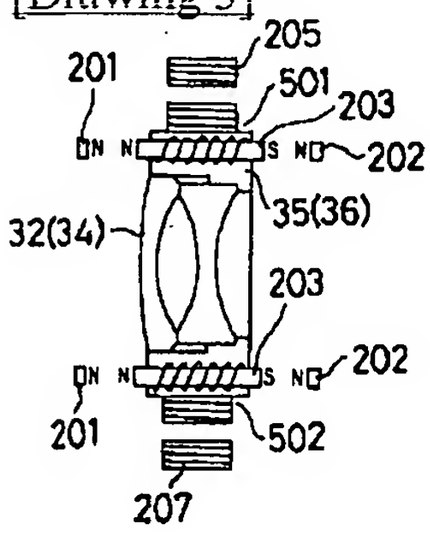
[Drawing 1]



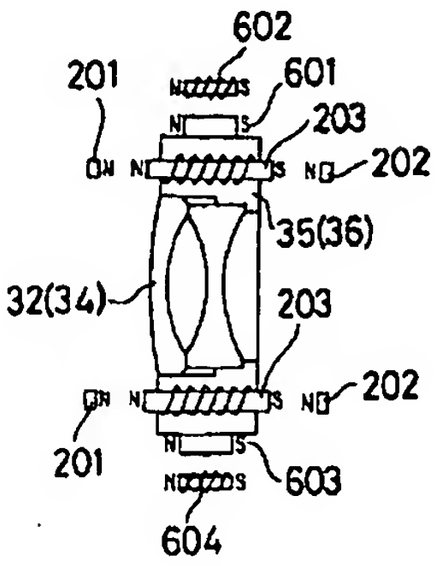
[Drawing 2]



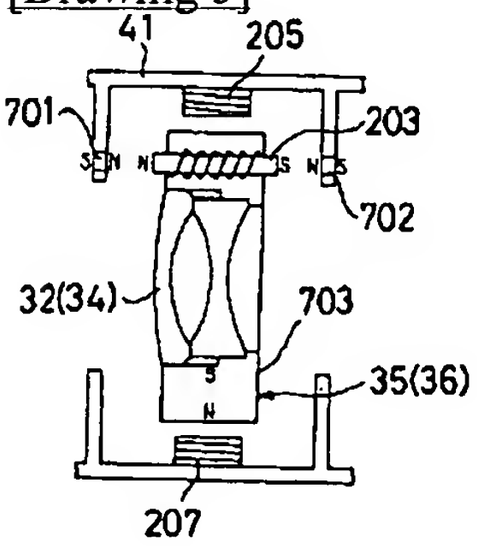
[Drawing 3]



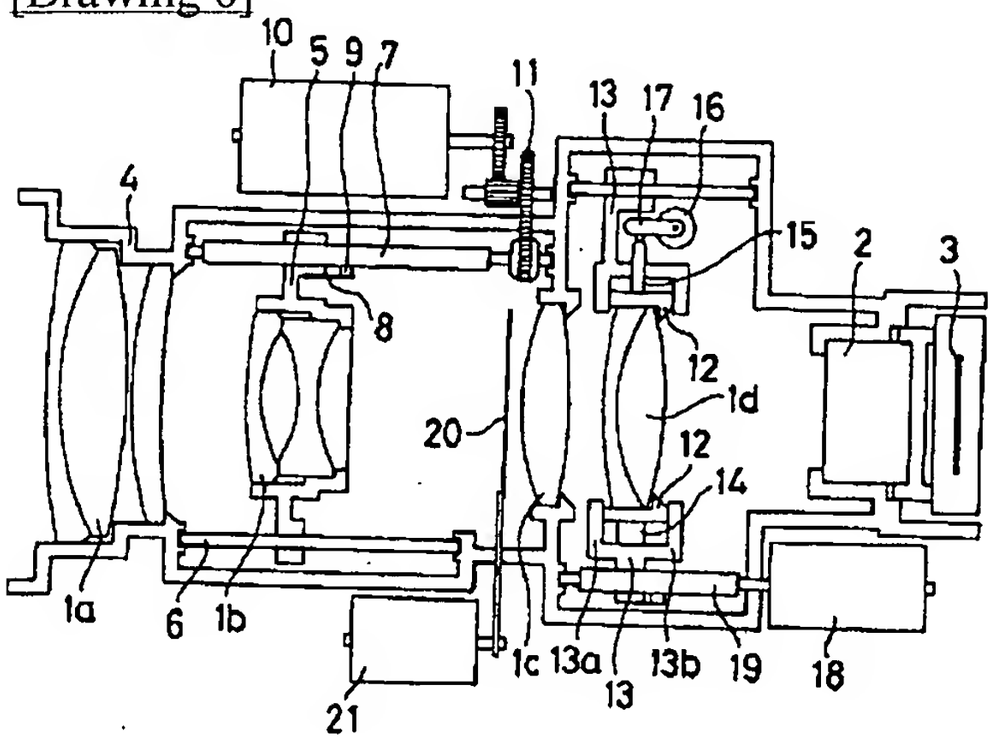
[Drawing 4]



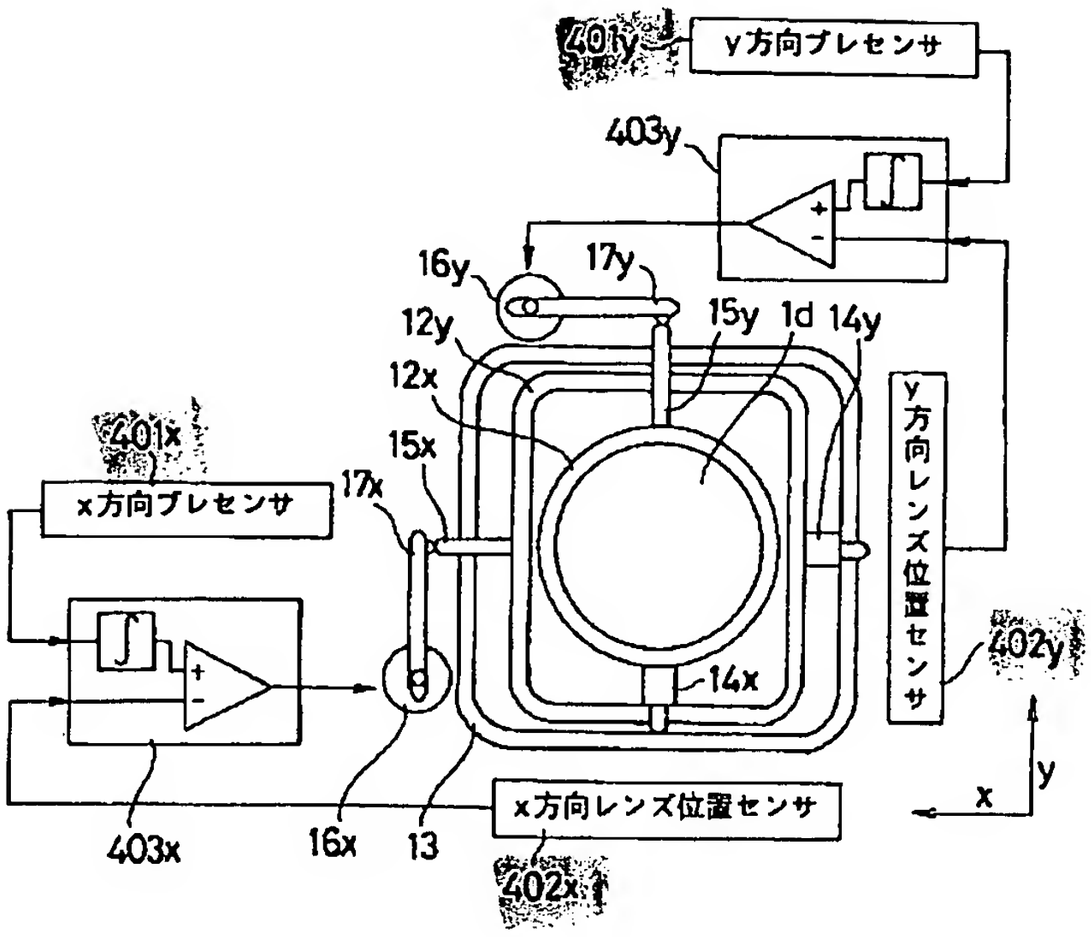
[Drawing 5]



[Drawing 6]



[Drawing 7]



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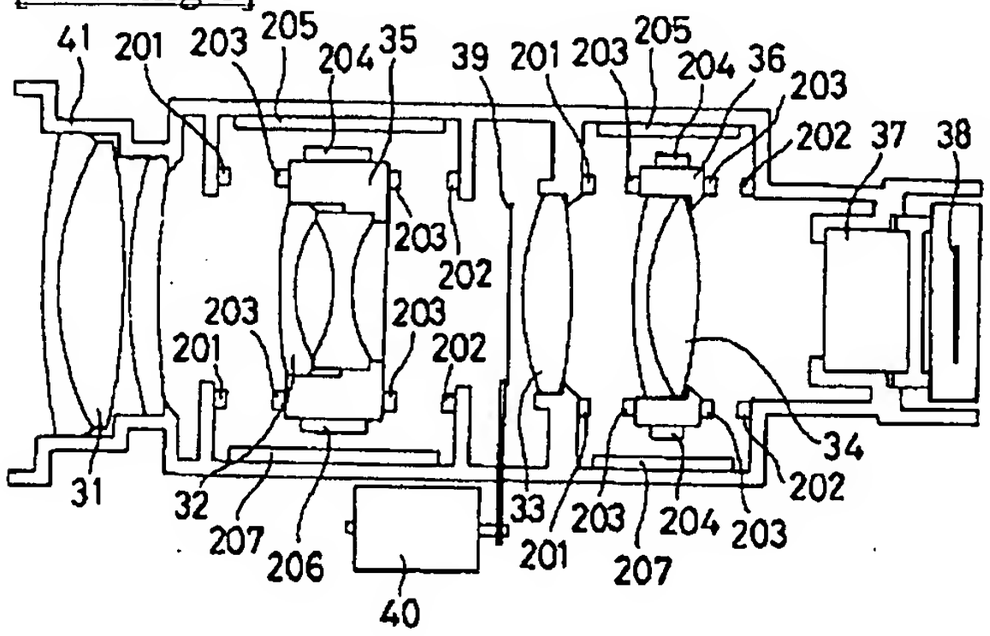
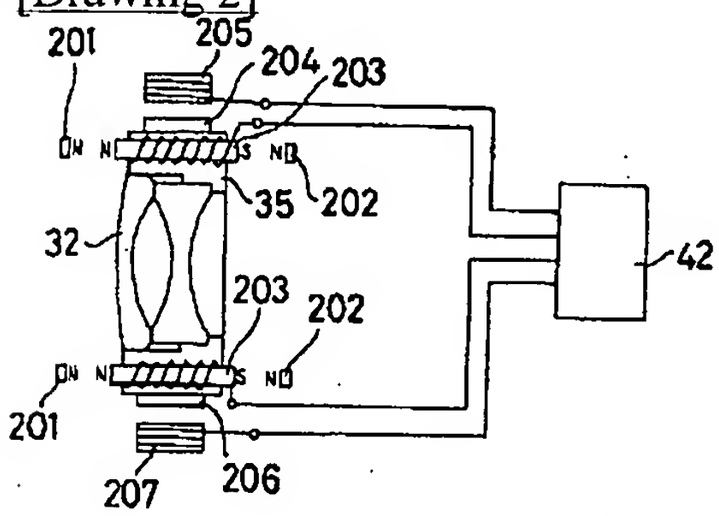
DRAWINGS

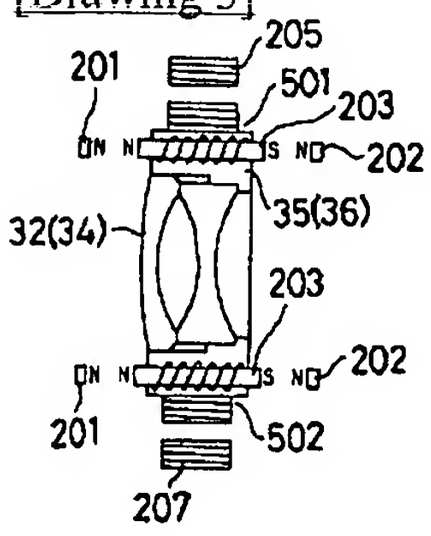
[Drawing 1]



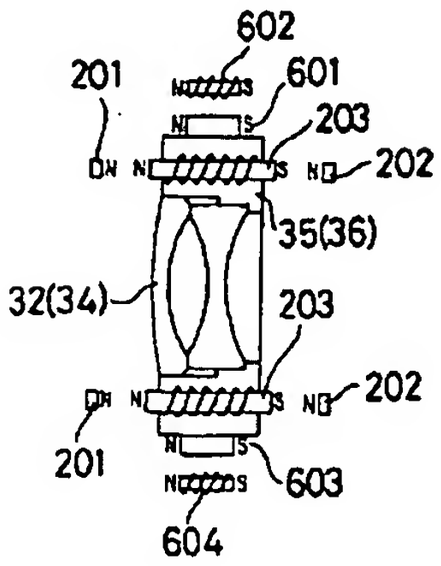
[Drawing 2]



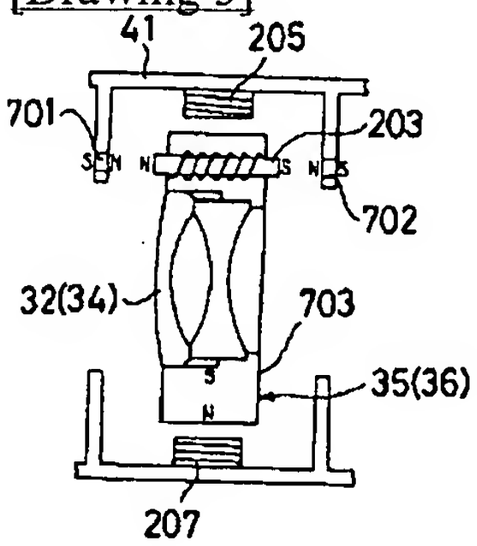
[Drawing 3]



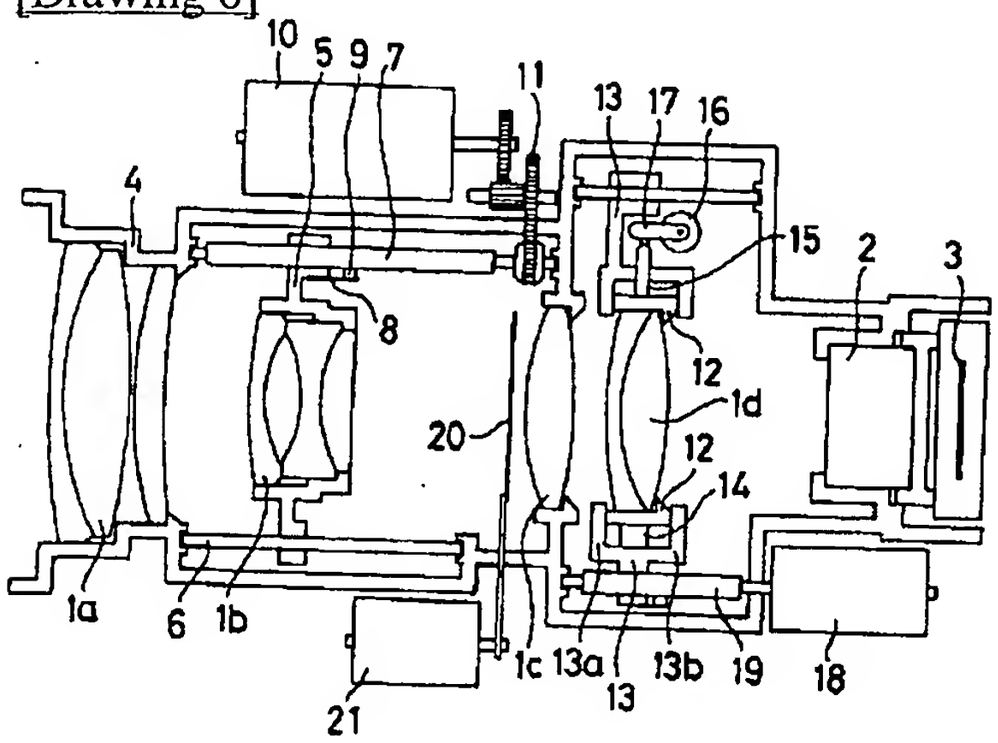
[Drawing 4]



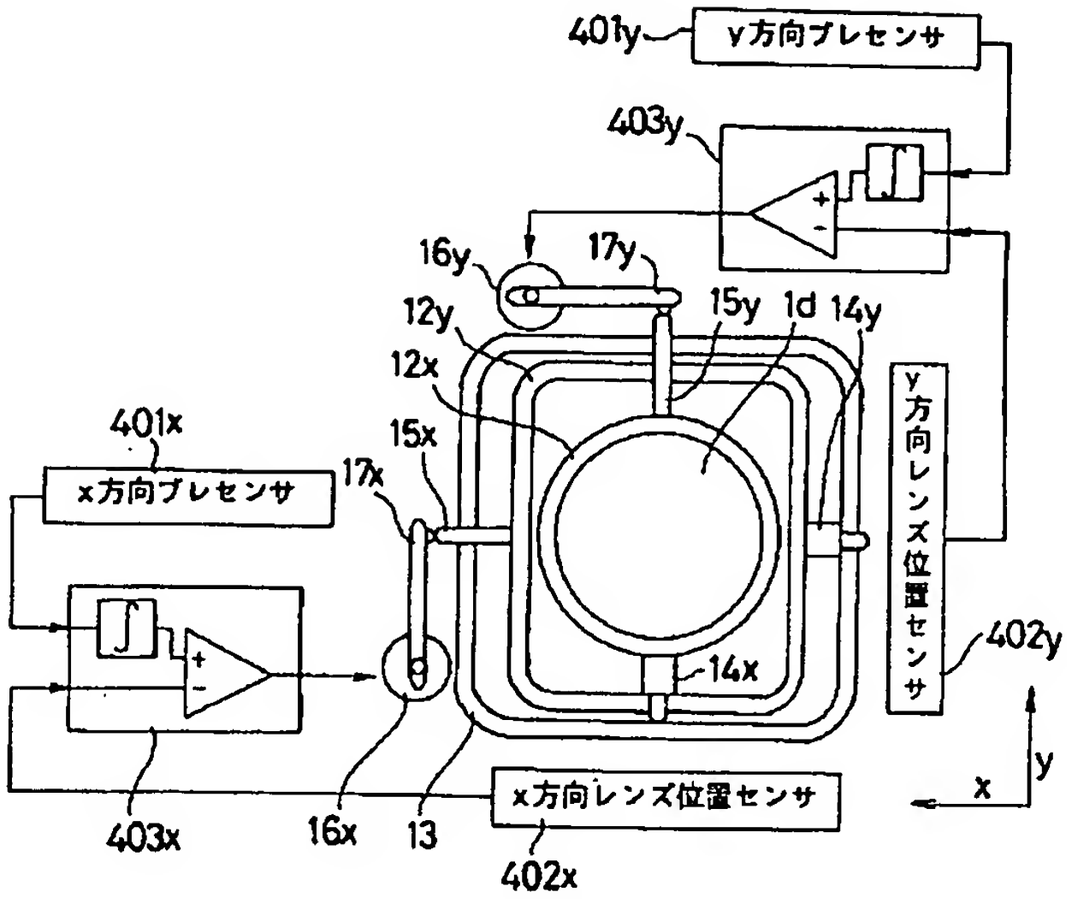
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Translation done.]